[0184] FIG. **12**A illustrates a tapped inductor converter as an interleaving converter. In the figure, the converter unit **530** includes first to third tapped inductor converters **611***a*, **611***b*, **611***c*.

[0185] The bypass diode unit **510** includes first to third bypass diodes Da, Db, Dc, which are disposed among node a, node b, node c, and node d, which correspond to the first to fourth conductive lines **135***a*, **135***b*, **135***c*, **135***d*.

[0186] The converter unit **530** may perform power conversion using the DC voltage Vpv output from the bypass diode unit **510**.

[0187] In particular, the first to third tapped inductor converters **611***a*, **611***b*, **611***c* output the converted DC voltages to the DC-link capacitor C**1** according to the interleaving operation.

[0188] The first tapped inductor converter **611***a* includes a tapped inductor T**1**, a switching device S**1** connected between the tapped inductor T**1** and the ground, and a diode D**1** connected to the output terminal of the tapped inductor to allow current flow in one direction. The DC-link capacitor C**1** is connected is connected between the output terminal of the diode D**1**, namely the cathode of the diode D**1** and the ground.

[0189] Specifically, the switching device S**1** may be connected between the tap of the tapped inductor T and the ground.

[0190] The output terminal (secondary side) of the tapped inductor T is connected to the anode of the diode D**1**, and the DC-link capacitor C**1** is connected between the cathode of the diode D**1** and the ground.

[0191] The primary side and secondary side of the tapped inductor T have opposite polarities. The tapped inductor T may be referred to as a switching transformer.

[0192] The primary side and secondary side of the tapped inductor T are connected, as shown in the figure. Thereby, the tapped inductor converter may be a non-insulation type converter.

[0193] If the three tapped inductor converters **611***a*, **611***b*, **611***c* are connected in parallel and driven in an interleaving manner as shown in figure, the input current component is branched in parallel, and thus ripple of the current components output from the tapped inductor converters **611***a*, **611***b*, **611***c* is reduced.

[0194] Each of tapped inductor converters **611***a*, **611***b*, **611***c* may adaptively operate according to the required power of the output AC voltage.

[0195] For example, if the required power is between about 90 W and about 130 W, only the first converter **611***a* operate. If the required power is between about 190 W and about 230 W, only the first and second converters **611***a*, **611***b* may operate. If the required power is between 290 W and about 330 W, all the first to third interleaving converters **611***a*, **611***b*, **611***c* may operate. That is, each of the tapped inductor converters **611***a*, **611***b*, **611***c* may selectively operate. Such selective operation may be controlled by the controller **550**.

[0196] The inverter **540** converts the DC voltage having a level converted by the converter unit **530** into an AC voltage. In the figure, a full-bridge inverter is illustrated. That is, an upper-arm switching device Sa, Sb is connected to a lower-arm switching device S'a, S'b in series to form one pair, and thus two pairs of upper-arm and lower-arm switching devices are connected in parallel (Sa&S'a, Sb&S'b). Each of the switching devices Sa, S'a, Sb, S'b are connected with a diode in reverse parallel.

[0197] The switching devices in the inverter **540** are turned on/off based on an inverter switching control signal from the controller **550**. Thereby, an AC voltage having a predetermined frequency is output. Preferably, the predetermined frequency is the same as the AC frequency of the grid (about 60 Hz or 50 Hz).

[0198] The filter unit **560** performs low-pass filtering to smooth the AC voltage output from the inverter **540**. To this end, indicators Lf**1**, Lf**2** are illustrated in the figure, but other various examples are also possible.

[0199] A converter input current sensing unit A senses an input current ic1 input to the converter unit **530**, and a converter input voltage sensing unit B senses an input voltage vc1 input to the converter unit **530**. The sensed input current ic1 and the input voltage vc1 may be input to the controller **550**.

[0200] A converter output current sensing unit C senses the output current ic2 of the converter unit **530**, namely, the DC-link current, and a converter output voltage sensing unit D senses the output voltage vc2 output from the converter unit **530**, namely the DC-link voltage. The sensed output current ic2 and output voltage vc2 may be input to the controller **550**.

[0201] An inverter output current sensing unit E senses a current ic3 output from the inverter **540**, and an inverter output voltage sensing unit F senses a voltage vc3 output from the inverter **540**. The sensed current ic3 and voltage vc3 are input to the controller **550**.

[0202] The controller **550** may output a control signal for controlling the switching device S**1** of the converter unit **530** of FIG. **12**. In particular, the controller **550** may output a turn-on timing signal of the switching device S**1** in the converter unit **530** based on at least one of the sensed input current ic1, input voltage vc1, output current ic2, output voltage vc2, output current ic3, and output voltage vc3.

[0203] The controller **550** may output an inverter control signal for controlling each of the switching devices Sa, S'a, Sb, S'b of the inverter **540**. In particular, the controller **550** may output a turn-on timing signal of the respective switching devices Sa, S'a, Sb, S'b of the inverter **540** based on at least one of the sensed input current ic1, input voltage vc1, output current ic2, output voltage vc2, output current ic3, and output voltage vc3.

[0204] The controller **550** may calculate the point of maximum power for the solar cell module **100**, and correspondingly control the converter unit **530** to output a DC power voltage corresponding to the maximum power.

[0205] The ground **541** of the inverter **540** is electrically connected to the ground line **320***a* of the cable **320**. A first line of the output lines of the filter unit **560** is electrically connected to the first power line **320***b* of the cable **320**. The second line of the output lines of the filter unit **560** is electrically connected to the second power line **320***c* of the cable **320**.

[0206] FIG. **12**B is an internal circuit diagram illustrating another example of the junction box of FIG. **11**.

[0207] Similar to the power conversion module **700** of FIG. **12**A, the power conversion module **700** of FIG. **12**B may include a bypass diode unit **510**, a converter unit **530**, a DC-link capacitor C**1**, an inverter **540**, a controller **550**, and a filter unit **560**.